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MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

BST1034 – STATISTICS FOR MANAGERS

(All sections / Groups)

31 May 2018
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **8** printed pages excluding the cover page, with **4** questions only.

2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. All necessary workings must be shown and please write all your answers in the answer booklet provided.

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QUESTION 1

a. A sample of interest rates on unpaid credit card balances yields the following data:

13.25 13.67 13.60 13.29 12.97 12.90 12.76 12.66 12.58 12.77

i. Determine the median of the data. (3 marks)
ii. Determine the mean of the data. (3 marks)
iii. Describe the shape of the data. (2 marks)
iv. Calculate the coefficient of variation of the data. (5 marks)

b. A study was recently done in which 500 people were asked to indicate their preferences for one of three products. The following table shows the breakdown of the responses based on the gender of the respondents.

Gender	Product Preference		
	A	B	C
Male	80	20	10
Female	200	70	120

Suppose one person is randomly chosen, what is the probability that

i. the chosen person prefer product A ? (2 marks)
ii. the chosen person is a female who prefers product C? (2 marks)

c. The owner of a minimart has determined that the distribution of customers arriving to the minimart follows a Poisson distribution with a mean of 4 people every 10 minutes. What is the probability that

i. less than 3 customers arrive during a 10 minute period? (3 marks)
ii. at least 2 customers arrive during a 10 minute period? (3 marks)
iii. exactly six customers arrive during a 20 minute period ? (2 marks)

(Total: 25 Marks)

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QUESTION 2

a. An economist believes that there is a close relationship between the asking price and the selling price in used cars' market. A random sample of n = 12 used cars that have sold recently was selected. The sample differences between asking price and selling price (in RM) are in the following table:

1000	1500	1720	1500
900	2000	1500	2100
1200	950	1300	1700

i. Construct a 95% confidence interval for the mean difference between asking price and selling price. (7 marks)

ii. Suppose that the economist believes that the mean difference between asking price and selling price for used cars in a particular market area is less than RM1500, test this assumption using an alpha level of 0.05. (7 marks)

b. In an effort to test the hypothesis that the proportion of males who go gyms regularly is greater than the proportion of females who go gyms regularly, the following data was collected.

	Who go gyms regularly	**Sample Size**
Male	230	800
Female	180	750

At a 0.05 significance level, is there sufficient evidence to conclude that proportion of males who go gyms regularly is greater than the proportion of females who go gyms regularly? (11 marks)

(Total: 25 Marks)

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QUESTION 3

a. A cruise company wants to select a computer software package for its reservation system. There are four software packages commercially available. The cruise company will choose the package that bumps as few passengers, on the average, as possible during a month. An experiment is set up in which each package is used to make reservations for 5 randomly selected weeks. The number of passengers bumped each week is obtained, which gives rise to the following descriptive statistics and the partially completed analysis of variance table:

SUMMARY

Groups	Count	Sum	Variance
Package 1	5	55	11.5
Package 2	5	19	2.7
Package 3	5	46	7.7
Package 4	5	43	15.8

ANOVA

Source of Variation	*SS*	*df*	*MS*
Between Groups	141.75	***	***
Within Groups	***	16	***
Total	***	19	

i. Compute the sum of squares within (*SSW*) the groups and complete the ANOVA table. (5 marks)

ii. If all the populations have equal variances and are normally distributed, is there a difference in the average numbers of customers bumped by the 4 packages at the 5% significance level? (8 marks)

b. The director of admissions at Multimedia University is interested in seeing if admissions status (admitted, waiting list, denied admission) at Multimedia University is independent of the type of community in which an applicant resides. He takes a sample of recent admissions decisions and forms the following table:

	Admitted	Wait List	Denied	Total
Urban	240	84	68	392
Rural	132	48	52	232
Suburban	256	64	56	376
Total	628	196	176	1000

Is there a relationship between the admissions status and type of community in which an applicant resides at the 10% significance level? (12 marks)

(Total: 25 Marks)

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QUESTION 4

a. An English lecturer collected the following data to determine if the marks of a student in her English subject during the semester could be used to predict the final score of the student's MUET result.

English's mark	92	65	81	78	75	88	85	55
MUET's score	250	142	180	170	160	195	200	135

i. Compute the coefficient of correlation. (3 marks)
ii. Compute the coefficient of determination (2 marks)
iii. Find the regression line of the final score for MUET. (5 marks)

b. In order to predict real estate purchases for Malaysia, three independent variables have been chosen. The variables are:

Y = real estate purchases (billions of ringgit)
X_1 = disposable personal income (billions of ringgit)
X_2 = Malaysia population (millions of persons)
X_3 = yearly installment credit (billions of ringgit)

The following partially completed computer output was obtained by using 20 years of data:

Source of Variation	*SS*	*df*	*MS*
Regression	52198	3	**
Error	***	**	**
Total	66430	19	

Predictor	*Coefficient*
Constant	-49.024
X_1	-0.0265
X_2	0.4415
X_3	0.8705

i. Complete the ANOVA table. (3 marks)
ii. State the multiple regression equation based on above information. (4 marks)
iii. Test whether the regression model is statistically significant at 5% significance level. (8 marks)

(Total: 25 Marks)

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APPENDIXES:

I. STATISTICAL FORMULAE

A. DESCRIPTIVE STATISTICS

Ungrouped Data:

Sample Mean, $\bar{x} = \frac{\sum x}{n}$ Sample Standard Deviation, $s = \sqrt{\frac{\sum x^2}{n-1} - \frac{(\sum x)^2}{n(n-1)}}$

Grouped Data:

Sample Mean, $\bar{x} = \frac{\sum fx}{\sum f}$ Sample Standard Deviation, $s = \sqrt{\frac{\sum fx^2}{\sum f - 1} - \frac{(\sum fx)^2}{\sum f(\sum f - 1)}}$

Median $= L_m + \left[\frac{\left(\frac{\sum f}{2} - F_{m-1}\right)}{f_m}\right]c$ Mode $= L_m + \left[\frac{(f_m - f_{m-1})}{2f_m - f_{m-1} - f_{m+1}}\right]c$

B. PROBABILITY DISTRIBUTION

Poisson Probability Distribution

If X follows a Poisson Distribution P (λ) where $P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$

then the mean = E(X) = λ and variance = VAR(X) = λ

Binomial Probability Distribution

If X follows a Binomial Distribution B(n, p) where $P(X = x) = {}^nC_x p^x q^{n-x}$

then the mean = E(X) = np and variance = VAR(X) = npq where $q = 1-p$

Normal Distribution

If $X \sim N(\mu, \sigma)$ where E(X) = μ and VAR(X) = σ^2, then $Z = \frac{X - \mu}{\sigma}$

C. CONFIDENCE INTERVAL ESTIMATION AND SAMPLE SIZE DETERMINATION

If σ known, $(100-\alpha)\%$ Confidence Interval for Population Mean, μ: $\bar{x} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$

If σ unknown, $(100-\alpha)\%$ Confidence Interval for Population Mean, μ: $\bar{x} \pm t_{\alpha/2,n-1}\frac{s}{\sqrt{n}}$

$(100-\alpha)\%$ Confidence Interval for Population Proportion, p: $p \pm Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}$

Sample Size Determination for Population Mean: $n \geq \frac{(Z_{\alpha/2})^2\sigma^2}{E^2}$

Sample Size Determination for Population Proportion: $n \geq \frac{(Z_{\alpha/2})^2 p(1-p)}{E^2}$

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D. HYPOTHESIS TESTING

One Sample Mean Test

Z-test: $Z = \dfrac{\bar{x} - \mu}{\dfrac{\sigma}{\sqrt{n}}}$ *t*-test: $t = \dfrac{\bar{x} - \mu}{\dfrac{s}{\sqrt{n}}}$

One Sample Proportion Test

$$Z = \frac{p - \pi}{\sqrt{\dfrac{\pi(1-\pi)}{n}}}$$

Two Sample Mean Test

Z-test: $Z = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}}$

t-test: $t = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_p\sqrt{\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}}$ where $s_p = \sqrt{\dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$

Two Sample Proportion Test

$$Z = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\bar{p}(1-\bar{p})\left[\dfrac{1}{n_1} + \dfrac{1}{n_2}\right]}} \qquad \text{where} = \bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

E. ANALYSIS OF VARIANCE

$$SST = \sum_{i=1}^{k}\sum_{j=1}^{n_j}\left(X_{ij} - \bar{\bar{X}}\right)^2 \qquad SSB = \sum_{i=1}^{k} n_i\left(\bar{X}_i - \bar{\bar{X}}\right)^2$$

$$SSW = \sum_{i=1}^{k}(n_i - 1)s_i^2 \quad \text{or} \quad SSW = \sum_{i=1}^{k}\sum_{j=1}^{n_i}\left(x_{ij} - \bar{x}_i\right)^2$$

F. CHI-SQUARE ANALYSIS

Expected cell frequencies for Independent Test: $E_i = \dfrac{Row\ total \times Column\ total}{N}$

Chi-Square test statistic: $\chi^2 = \sum \dfrac{(O_i - E_i)^2}{E_i}$

O_i = Observed frequency in a particular cell

E_i = expected frequency in a particular cell

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G. REGRESSION ANALYSIS

Correlation Coefficient: $$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Simple Linear Regression: $Y = a + bX$ where $b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$ and $a = \bar{y} - b\bar{x}$

H. INDEX NUMBERS

Simple Price Index $P = \frac{p_i}{p_0} \times 100$	**Laspeyres Quantity Index** $P = \frac{\sum p_0 q_i}{\sum p_0 q_0} \times 100$
Simple Aggregate Price Index $P = \frac{\sum p_i}{\sum p_0} \times 100$	**Paasche Quantity Index** $P = \frac{\sum p_i q_i}{\sum p_i q_0} \times 100$
Laspeyres Price Index $P = \frac{\sum p_i q_0}{\sum p_0 q_0} \times 100$	**Fisher's Ideal Price Index** $\sqrt{(\text{Laspeyres Price Index})(\text{Paasche Price Index})}$
Paasche Price Index $P = \frac{\sum p_i q_i}{\sum p_0 q_i} \times 100$	**Value Index** $V = \frac{\sum p_i q_i}{\sum p_0 q_0} \times 100$

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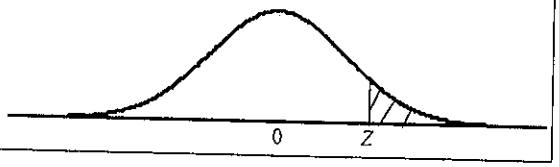
II. STATISTICAL TABLE

Table 1

The Upper Tail Area Under the Standard Normal Curve



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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